CLAIMS

1. A tape-like material containing carbon nanotubes produced by arc discharge.

2. A tape-like material containing carbon nanotubes having a thickness in the range of 10 to 500 μm, a width in the range of 1 to 10 mm, and an arbitrary length, and principally having flocculated carbon nanotubes.

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3. A tape-like material containing carbon nanotubes synthesized by forming a path of arc discharge along the stream of a gas supplied from an anode to a cathode comprising a carbon material, and simultaneously by relatively moving the anode and the cathode so as to move a cathode spot of an arc on the cathode.

4. A tape-like material containing carbon nanotubes synthesized by generating an arc along the stream of a gas supplied from the inside of a hollow anode to a cathode comprising a carbon material, and simultaneously by relatively moving the anode and the cathode so as to move a cathode spot of the arc on the cathode.

5. A tape-like material containing carbon nanotubes synthesized by generating an arc along the stream of a gas supplied together with a metal or metal compound powder

catalyst from the inside of a hollow anode to a cathode comprising a carbon material, and simultaneously by relatively moving the anode and the cathode so as to move a cathode spot of the arc on the cathode.

6. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 5, wherein arc discharge is performed in a normal atmosphere.

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7. The tape-like material containing carbon nanotubes according to any one of Claims 3 to 6, wherein the gas supplied from the anode to the cathode is argon or a mixture of argon gas and hydrogen gas.

8. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 7, wherein the anode and the cathode are relatively moved so that the arc generation point on the surface of the cathode has a substantially constant temperature history, except for positions of arc generation start and termination.

9. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 8, wherein the tape-like material is produced by moving the cathode spot so as not to be formed repeatedly in the same region on the surface of the cathode.

10. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 9, wherein the tape-like material is produced by performing arc discharge while the entire cathode, the cathode spot of the arc, or the front portion of an arc in an arc track on the cathode is heated.

11. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 10, wherein the tape-like material is produced by a synthesis using a carbon material having an electrical resistivity of 4,000 $\mu\Omega \cdot cm$ or more, or a thermal conductivity of 40 $W/m \cdot K$ or less as the cathode.

12. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 11, wherein the tape-like material is produced by a synthesis using a carbon material having an arithmetic average surface roughness (Ra) of 3.2 μm or less as the cathode.

13. The tape-like material containing carbon nanotubes according to any one of Claims 1 to 12, wherein the tape-like material is produced by a synthesis in which a gas is jetted onto a product produced on the locus of the cathode spot of the arc in a cooling step immediately after arc discharge.

14. A field emission electrode including the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13, the tape-like material being pinched

between substrates or bonded to a substrate.

15. A field emission electrode including the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13, wherein the tape-like material is torn by pinching between substrates or between a substrate and a material more deformable than the substrate to apply a pressure, and then separating the substrates or the substrate and deformable material, whereby the field emission electrode has the torn tape-like material adhering to the substrate.

16. The field emission electrode according to Claim 15, wherein the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13 is pinched such that the surface thereof which was opposed to the anode during synthesis is in contact with the substrate.

17. A process for producing a field emission electrode, comprising the step of pinching the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13 between substrates, or bonding the tape-like material to a substrate with a conductive adhesive.

18. A process for producing a field emission electrode, the process comprising the step of: pinching the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13 between substrates or between a substrate

and a material more deformable than the substrate to apply a pressure, and then separating the substrates or the substrate and deformable material, whereby the field emission electrode has the torn tape-like material adhering to the substrate.

19. The process for producing a field emission electrode according to Claim 18, wherein the tape-like material containing carbon nanotubes as set forth in any one of Claims 1 to 13 is pinched such that the surface thereof which was opposed to an anode during synthesis is in contact with the substrate.

20. A process for producing carbon nanotubes, wherein a path of arc discharge is formed along the stream of a gas supplied from an anode to a cathode comprising a carbon material.

21. A process for producing carbon nanotubes by arc discharge, wherein an arc is generated while an inert gas or an inert gas-containing mixed gas is jetted onto a cathode comprising a carbon material from the inside of a hollow electrode used as an anode.

22. A process for producing carbon nanotubes, wherein a path of arc discharge is formed along the stream of a gas supplied together with a metal powder or metal compound powder serving as a catalyst, from an anode to a cathode comprising a

carbon material.

23. A process for producing carbon nanotubes by arc discharge, wherein an arc is generated while an inert gas or an inert gas-containing mixed gas is jetted together with a metal powder or metal compound powder serving as a catalyst onto a cathode comprising a carbon material from the inside of a hollow electrode used as an anode.

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24. The process for producing carbon nanotubes according to any one of Claims 20 to 23, wherein arc discharge is performed in a normal atmosphere.

25. The process for producing carbon nanotubes according to any one of Claims 21, 23, and 24, wherein the gas flow rate of the inert gas or inert gas-containing mixed gas jetted onto the cathode from the inside of the hollow electrode is in the range of 10 to 400 mL/min per square millimeter of cross section of the bore of the hollow electrode.

26. The process for producing carbon nanotubes according to any one of Claims 20 to 25, wherein argon or a mixture of argon gas and hydrogen gas is used as the inert gas or inert gas-containing mixed gas.

27. The process for producing carbon nanotubes according to any one of Claims 20 to 26, wherein the cathode is preheated

to a temperature in the range of 500 to 2,000°C before arc discharge.

28. The process for producing carbon nanotubes according to any one of Claims 20 to 27, wherein the cathode electrode comprises a carbon material having an electrical resistivity of 4,000 $\mu\Omega \cdot cm$ or more, or a thermal conductivity of 40 $W/m \cdot K$ or less.

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29. A process for producing carbon nanotubes by arc discharge, wherein a path of the arc discharge is formed along the stream of an inert gas or inert gas-containing mixed gas supplied from an anode to a cathode comprising a carbon material, and simultaneously, the anode and the cathode are relatively moved so as to move a cathode spot of an arc on the cathode.

30. A process for producing carbon nanotubes by arc discharge, wherein an arc is generated while an inert gas or an inert gas-containing mixed gas is jetted onto a cathode comprising a carbon material from the inside of a hollow electrode used as an anode, and simultaneously, the anode and the cathode are relatively moved so as to move a cathode spot of the arc on the cathode.

31. A process for producing carbon nanotubes by arc discharge, wherein an arc is generated while an inert gas or

an inert gas-containing mixed gas is jetted together with a metal powder or metal compound powder serving as a catalyst onto a cathode comprising a carbon material from the inside of a hollow electrode used as an anode, and simultaneously, the anode and the cathode are relatively moved so as to move a cathode spot of the arc on the cathode.

32. The process for producing carbon nanotubes according to any one of Claims 29 to 31, wherein the cathode spot of the arc is relatively moved on the surface of the cathode material at a speed in the range of 10 to 1,000 mm/min, by relatively moving the anode and the cathode.

33. The process for producing carbon nanotubes according to any one of Claims 29 to 32, wherein the arc discharge is performed in a normal atmosphere.

34. The process for producing carbon nanotubes according to any one of Claims 30 to 33, wherein the gas flow rate of the inert gas or inert gas-containing mixed gas jetted onto the cathode from the inside of the hollow electrode is in the range of 10 to 400 mL/min per square millimeter of cross section of the bore of the hollow electrode.

35. The process for producing carbon nanotubes according to any one of Claims 29 to 34, wherein argon or a mixture of argon gas and hydrogen gas is used as the inert gas or inert

gas-containing mixed gas.

36. The process for producing carbon nanotubes according to any one of Claims 29 to 35, wherein the anode and the cathode are relatively moved so that the arc generation point on the surface of the cathode has a substantially constant temperature history, except for positions of arc generation start and termination.

37. The process for producing carbon nanotubes according to any one of Claims 29 to 36, wherein the cathode spot is moved so as not to be formed repeatedly in the same region on the surface of the cathode.

38. The process for producing carbon nanotubes according to any one of Claims 29 to 37, wherein arc discharge is performed while the entire cathode, the cathode spot of the arc, or the front portion of an arc in an arc track on the cathode is heated.

39. The process for producing carbon nanotubes according to any one of Claims 29 to 38, wherein the cathode electrode comprises a carbon material having an electrical resistivity of 4,000 $\mu\Omega \cdot cm$ or more, or a thermal conductivity of 40 $W/m \cdot K$ or less.

40. The process for producing carbon nanotubes according to

any one of Claims 29 to 39, wherein a carbon material having an arithmetic average surface roughness (Ra) of 3.2 μm or less is used as the cathode.

41. The process for producing carbon nanotubes according to any one of Claims 29 to 40, wherein the carbon nanotubes are produced in a synthesis in which a gas is jetted onto a product produced on the locus of the cathode spot of the arc in a cooling step immediately after arc discharge.

42. The process for producing carbon nanotubes according to any one of Claims 29 to 41, wherein the carbon nanotubes constitute an aggregate in a tape form.